

What is claimed is:

1     1.     A method for removing fluorine gas from a selected environment,  
2     comprising the steps of: (a) contacting the fluorine gas from the  
3     environment with a selected quantity of water, thereby to generate an  
4     acidic solution of hydrofluoric acid; and (b) contacting said acidic solution of  
5     hydrofluoric acid with an ion-exchange resin having an active state  
6     operative to exchange selected ions therein for fluoride ions in said acidic  
7     solution when in contact therewith,

8  
9             wherein said ion-exchange resin is capable of chemically shifting  
10    between said active state and an exhausted state operative to exchange  
11    the fluoride ions in said ion-exchange resin for the selected ions contained  
12    in a regenerant solution when in contact therewith, and including the step of  
13    regenerating said ion-exchange resin by contacting said ion-exchange  
14    resin with the regenerant solution thereby to form a selected regenerant  
15    waste product containing the fluoride ions, and

16  
17             wherein said regenerant solution is selected from the group  
18    consisting of ammonium hydroxide solution, waste ammonium hydroxide  
19    solution, and any combination thereof.

1     2.     A method according to claim 1 wherein the regenerant solution is  
2     waste ammonium hydroxide solution.

1     3.     A method according to claim 1 wherein the waste ammonium  
2     hydroxide solution is generated from one or more processes associated  
3     with the fluorine gas from a selected environment.

1     4.     An apparatus for use in removing fluorine from a selected  
2     environment, comprising: (a) an inlet in communication with the selected  
3     environment and operative to provide fluorine gas therefrom; (b) a conduit

4 in communication with said inlet and adapted to receive fluorine gas  
5 therefrom, said conduit operative to transport an aqueous solution  
6 therethrough; (c) a resin vessel in fluid communication with said conduit  
7 and operative to receive the aqueous solution therefrom; and (d) an ion-  
8 exchange resin disposed in said resin vessel and adapted to contact said  
9 aqueous solution, said ion-exchange resin having an active state operative  
10 to exchange selected ions therein for fluoride ions in said aqueous solution  
11 at an acidic pH when in contact therewith,

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13 wherein said ion-exchange resin is capable of chemically shifting  
14 between said active state and an exhausted state operative to exchange  
15 the fluoride ions in said ion-exchange resin for the selected ions contained  
16 in a regenerant solution when in contact therewith, said apparatus including  
17 a regenerant source vessel adapted to receive the regenerant solution,  
18 said regenerant source vessel in fluid communication with said resin vessel  
19 and operative to selectively provide the regenerant solution to said resin  
20 vessel, and

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22 wherein said regenerant source vessel is operative to selectively  
23 provide a regenerant solution selected from the group consisting of  
24 ammonium hydroxide, waste ammonium hydroxide, and any combinations  
25 thereof.

1 5. An apparatus according to claim 4 wherein the regenerant solution is  
2 waste ammonium hydroxide solution.

1 6. An apparatus according to claim 4, wherein the waste ammonium  
2 hydroxide is generated from one or more processes associated with the  
3 fluorine from a selected environment.